


## Scratch: Countdown Spirals

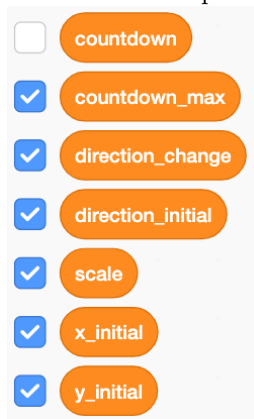


Remember the countdown spirals? In the example below, the pen moves 16 units, then 15 units, then 14 units, and the segments get smaller and smaller down to 1 unit, after which the next segment is 16 units, then 15 units, etc. . . and after each segment the direction is changed by  $72^\circ$ .

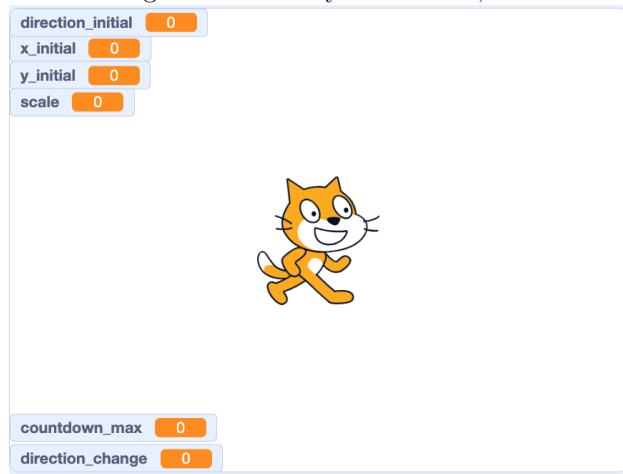


Our goal is to produce these patterns in Scratch. You will **submit a slideshow** with a variety of your best results. You need to have at least 6 high-quality images of distinct spiral patterns for full credit. Each image should also show the parameter settings used to generate the image.

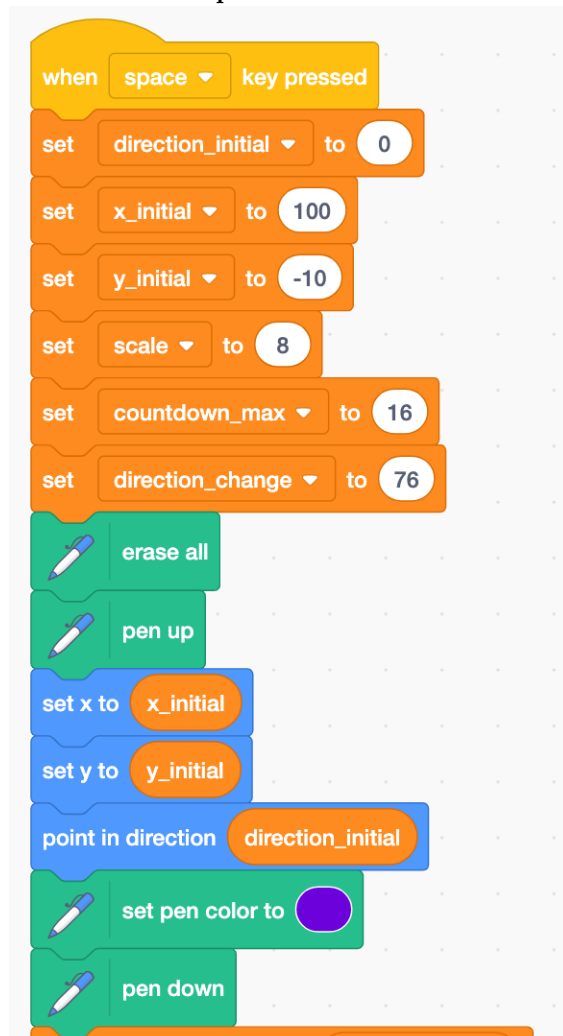
1. Go to [scratch.mit.edu](https://scratch.mit.edu)
  - Login (to save your work)
  - **Open a new project**
2. Click “Add Extension” button (bottom left of screen). 
  - Choose the **Pen extension**.
3. Make some variables.
  - On left side, click the “Variables” section of code. (The orange dot.)
  - For each variable we need, click “Make a Variable”, and then type the variable name.
  - **Make 7 variables:**
    - `x_initial`: the  $x$  coordinate to start the drawing.
    - `y_initial`: the  $y$  coordinate to start the drawing.
    - `direction_initial`: the direction to move at start of drawing.
    - `scale`: a multiplier to make drawing bigger or smaller.
    - `direction_change`: angle turned after each segment (72 in the example above)
    - `countdown_max`: the highest number when counting down (16 in the example above)
    - `countdown`: the current countdown number. It starts at `countdown_max`, decreases by 1 after each segment is drawn, and returns to `countdown_max` after reaching 1. This `countdown` variable will change frequently during the course of producing the pattern. Each segment’s length is the product of `countdown` times `scale`. The other variables are the “parameters”: they will be set before the drawing begins, and not change during the drawing. This one (`countdown`) will be changed over and over by the code. The other variables acting this way are already defined by Scratch: `x position`, `y position`, and `direction`.
  - We want all the parameters to show on the screen, so keep them checked. Uncheck `countdown`.



4. In the right-most frame, rearrange the parameter readouts by clicking and dragging.
  - The drawings will be mostly circular-ish, so make room for a large circle.



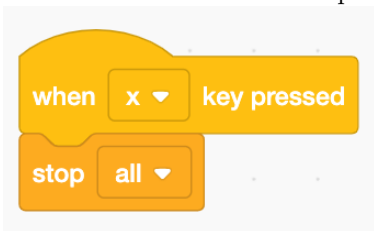
5. Start the code. In the left-most frame, find the correct elements, and drag them into place.
  - After “Space” is hit: set the parameters, clear the previous drawings, lift the pen, move the pen to the initial position and direction, and put the pen back down.
  - You will **set the parameters here** for each drawing.



6. Code the drawing loop. (All the code from steps 5 and 6 is together in one chunk.)

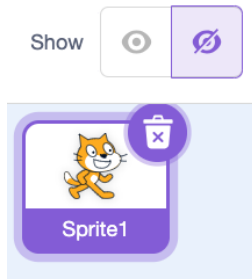


7. Code a new chunk to interrupt the drawing by pressing “x”.



8. Hide the sprite. (Hide the cat.)


- Near the bottom-right frame, click the show/hide sprite toggle.



9. **DOCUMENT** your own patterns in a slideshow!

- Adjust the parameters in the top of the code, press space bar to run the code.
  - The main parameters are **countdown\_max** and **direction\_change**. These fundamentally alter the pattern drawn.
  - The other parameters allow you to scale and move the drawing.
- DO NOT** let drawing hit edge of screen. Use a smaller **scale** value if this happens.
- Try to make the drawing as large as possible without hitting the edge of the window or going behind the readouts.
- Try to center the image vertically by adjusting the **y\_initial** value.
- Document your best patterns.**
  - Start a new slideshow. Use [slides.new](https://slides.new) for google slides.

- For a title page, include your name, date, and a title... something like “Countdown Spirals”
- When you have a high-quality spiral, take a screenshot including the readouts. Paste the screenshot into the slideshow as its own slide.

- Before taking a screenshot, go to full-screen mode.  (Button near top-right.)